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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/719,000

11/21/2003

William A. Goddard III

1950-0022

9073

23980

7590

01/07/2009

MINTZ, LEVIN, COHN, FERRIS, GLOVSKY AND POPEO, P.C

5 Palo Alto Square - 6th Floor

3000 El Camino Real

PALO ALTO, CA 94306-2155

EXAMINER

MCCRACKEN, DANIEL

ART UNIT

PAPER NUMBER

1793

MAIL DATE

DELIVERY MODE

01/07/2009

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/719,000	<b>Applicant(s)</b> GODDARD ET AL.	
	<b>Examiner</b> DANIEL C. MCCracken	<b>Art Unit</b> 1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 30 September 2008.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 17-20,23-31 and 34-36 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 17-20,23-31 and 34-36 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

**DETAILED ACTION**

Citation to the Specification will be in the following format: (S. # : ¶/L) where # denotes the page number and ¶/L denotes the paragraph number or line number. Citation to patent literature will be in the form (Inventor # : LL) where # is the column number and LL is the line number. Citation to the pre-grant publication literature will be in the following format (Inventor # : ¶) where # denotes the page number and ¶ denotes the paragraph number.

***Response to Arguments, Remarks***

Claims 1-16, 18, 21-25 and 37-43 are acknowledged as cancelled. Claims 17, 23, 26-27, 29-31, 34 and 36 are acknowledged as being amended. Applicants have stated their intent to possibly pursue continuation applications over their “pillared carbon material” claims. Applicants should ensure that any future examiner is made aware of the rejections over such claims in this case.

**Claim Rejections – 35 U.S.C. §§ 102-103, 112**

With respect to all rejections, Applicants have ***heavily*** amended or cancelled all of the independent claims, presumably for purposes of patentability. The claims define the invention. 35 U.S.C. 112, second paragraph. As the prior rejection was tailored to a different “invention,” (i.e. a “pillared carbon material”), the rejections are WITHDRAWN in light of Applicants amendment.

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Request for Information

Applicants request guidance as to what search results to submit. The Examiner requests only those search results that “establish[], by itself or in combination with other information, a prima facie case of unpatentability of a claim,” 37 C.F.R. 1.56(b)(1), or those that “refutes, or is inconsistent with, a position the applicant takes in: (i) Opposing an argument of unpatentability relied on by the Office, or (ii) Asserting an argument of patentability.” 37 C.F.R. 1.56(b)(2). If however, Applicants merely typed “Diels Alder” into the USPTO search engine to find out that such a reaction exists (which they presumably knew before filing this case) and did nothing more (which it would appear from their arguments they did not), then submission of such results are not necessary.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 17-20, 23-31, 34-36 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The methodology adopted by the Office for determining the adequacy of the written description is set forth in MPEP 2163, *et seq.* The Examiner recognizes and appreciates the

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strong presumption that an adequate written description of the claimed invention is present when the application is filed. *See In re Werthheim*, 541 F.2d 257, 262, 191 USPQ 90, 96 (CCPA 1976). Further, the Examiner recognizes and appreciates the burden is on the Office to present evidence or reasons why one skilled in the art would not recognize that the written description provides support for the claims. As such, the Examiner makes the following findings of fact in accordance with the Office methodology as set forth at MPEP 2163 II. (“Methodology for Determining Adequacy of Written Description”).

*Read and Analyze the Specification for Compliance with 35 U.S.C. 112, para. 1*

1. For Each Claim, Determine What the Claim as a Whole Covers:

The independent claims are *now* drawn to a method of making a carbon material. Applicants have narrowed “carbon material” to “graphene sheets,” as well reciting the distance between the graphene sheets. The method is allegedly carried out via a Diels-Alder reaction between alkali metal containing organic ligands and the graphene sheets to form *carbene sheets*. The “graphene sheets” are separated by a very specific distance, and the sheets are subsequently doped.

2. Review the Entire Application to Understand How Applicant Provides Support for the Claimed Invention Including Each Element and/or Step:

Initially, it is unclear (as reflected by the rejections under 35 U.S.C. 112, second paragraph) what carbene sheets are being formed. In fact, “carbene” does not appear to be present in the specification until this latest set of amendments filed 9/30/2008.

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To be sure, carbenes are known in the literature, but when combined with “sheet” in the claim, it is unclear what is being described.

3. Determine Whether There is Sufficient Written Description to Inform a Skilled Artisan That Applicant was in Possession of the Claimed Invention as a Whole at the Time the Application Was Filed

Possession can be shown in any number of ways, for example describing an actual reduction to practice or a clear depiction of the invention in the drawings. It is noted that Applicants have presented no reduction to practice whatsoever. While certain drawings are present, it is unclear if these show carbene sheets or not. Applicants can show possession by identifying characteristics of the claimed invention. Here, the carbene sheets have not been identified.

Finally the Examiner notes that the only thing remotely coming close to demonstrating possession is a computer simulation (that is, something that does not involve physically making or possessing the claimed subject matter with the claimed process of making). This is not persuasive in the slightest. How do Applicants know the material will arrange itself in the manner it is purported to with the dimensions claimed?

Claims 17-20, 23-31, and 34-36 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which

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was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The analysis for determining whether a claim is supported by the disclosure is cast in terms of whether “undue experimentation” is necessary to practice the invention. *See* MPEP 2164.01. In examining the claims in light of the supporting disclosure, the Federal Circuit has provided a non-exclusive list of factors to consider in determining whether a disclosure is enabling. *See generally In re Wands*, 858 F.2d 731, 737, 8 USPQ2d 1400, 1404 (Fed. Cir. 1988).

These factors include:

- a. The breadth of the claims;
- b. The nature of the invention;
- c. The state of the prior art;
- d. The level of one of ordinary skill;
- e. The level of predictability in the art;
- f. The amount of direction provided by the inventor;
- g. The existence of working examples; and
- h. The quantity of experimentation needed to make or use the invention based on the content of the disclosure

*Id.* “Whether undue experimentation is needed is not a single, simple factual determination, but rather is a conclusion reached by weighing many factual considerations.” *Id.* Examiner has considered all factors in light of all claims rejected makes the following findings of fact:

a. The breadth of the claims

The independent claims are broadly drawn to recite include all alkali metal organic ligands. It is not entirely clear what happens in each step – does the reaction require additional steps when the “Diels-Alder” reaction is carried out? How do graphene sheets form carbene sheets?

b. The nature of the invention

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The invention is *now* a method of reacting graphene sheets with organic ligands via various combinations including a "Diels-Alder" reaction.

c. The state of the prior art and the level of one of ordinary skill

The level of skill is high, typically a PhD chemist.

d. The level of predictability in the art

The chemical arts are generally viewed as unpredictable.

e. The amount of direction provided by the inventor

Applicants have provided scant if any guidance. The words "Diels-Alder" are recited, but – according to Applicants – there are at least over 5,000 pieces of patent literature dealing with "Diels-Alder" chemistry. Applicants however do not limit their disclosure to "Diels-Alder" chemistry, but rather recite "Diels-Alder type reaction[s]." (S. 10: [00041]). What is this? The fact that Google™ Scholar lists 400 documents that recite "Diels-Alder type" only supports the enablement rejection. The public is left with (according to Applicants) over 5,000 pieces of patent literature and over 400 pieces of non-patent literature that say the words "Diels-Alder" or "Diels-Alder type." Applicants have not shown a single Diels-Alder reaction that works with any of the claimed metals or starting materials. Nor have they showed or explained the formation of "carbene sheets."

f. The existence of working examples

No working examples whatsoever were provided. This factor is highly probative to the rejection. It is highly unusual for patent applicants in the chemical arts to be filed without a single working example. The Examiner places very *little* weight on Applicants computer simulation. The computer does exactly what it is programmed to.



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g. The quantity of experimentation needed to make or use the invention based on the content of the disclosure

Viewed in toto, arguably infinite and certainly undue experimentation is needed to practice the invention. Given the structural ambiguity of what is being claimed (carbene *sheets*), the dimensions claimed, the breadth of the prior art dealing with Diels-Alder (type) chemistry, and the total lack of working examples, the claims are not enabled, even in light of the high level of skill in the art. A declaration detailing how the method was performed in the laboratory would be probative in traversing this rejection. This should not be burdensome, as (at least according to the oath signed under penalty of perjury), Applicants have “invented” this method.

***Claim Rejections - 35 USC § 103***

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 17-20, 23-25, 27-31, and 34-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5,653,951 to Rodriguez in view of Inagaki, et al., *Determining factors for the intercalation into carbon materials from organic solutions*, 39 Carbon 1083 (2001).

With respect to Claims 17 and 36 Rodriguez describes preparing a carbon composition that is doped with a metal. To the extent Rodriguez may not disclose preparing a ligand, Inagaki describes providing a solvated alkali metal containing organic ligands, combining it with a carbon material and forming a “pillared” carbon material. *See generally* Inagaki, 39 Carbon at 1084 (“2. Intercalation reaction”). One would be motivated to make this combination due to the

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ability to alter the interstices in the layered carbon material so as to affect the materials ability to store gas. *See e.g.* (Rodriguez 3, 35 *et seq.*) (discussing the affect of interstices and crystallinity on gas storage) *and* Inagaki, 39 Carbon at 1086 (discussing the affect that different metal ions have on spacing between carbon layers). As to Claim 18, Inagaki discloses Li, Na and K. *Id.* As to Claim 23, Inagaki teaches a number of heterocyclic solvents. Inagaki, 39 Carbon at 1084. As to Claim 24, Inagaki teaches unidentate and bidentate ethers as solvents. *Id.* As to Claim 25, 2,5-dihydrofuran is not explicitly taught, but reasonably suggested by Inagaki's teaching of unidentate and bidentate ethers. *Id.* As to Claim 27, Rodriguez discloses an impurity. (Rodriguez 8: 40-49). As to Claim 35, Rodriguez '951 discloses an interlayer distance of 0.67 nanometers, equivalent to 6.7 angstroms. (Rodriguez 3: 27). It is expected that the properties of the products claimed are necessarily present.

Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over US 5,653,951 to Rodriguez in view of Inagaki, et al., *Determining factors for the intercalation into carbon materials from organic solutions*, 39 Carbon 1083 (2001) and in further view of Janot, et al., *Ball Milling: a new route for the synthesis of superdense lithium GICs*, 39 Carbon 1931 (2001).

With respect to Claim 26, to the extent Rodriguez does not disclose ball milling. Janot describes ball milling to intercalate lithium into graphite. One would be motivated to combine the ball milling technique of Janot to dope a metal as taught by Rodriguez because the technique results in "a well-crystallized compound." Janot, 39 Carbon at 1931. *See also* (Rodriguez at 3: 35 *et seq.*) (discussing the importance of crystallinity).

***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

All amendments made in response to this Office Action must be accompanied by a pinpoint citation to the Specification (i.e. page and paragraph or line number) to indicate where Applicants are drawing their support.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL C. MCCracken whose telephone number is (571)272-6537. The examiner can normally be reached on Monday through Friday, 9 AM - 6 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley S. Silverman can be reached on (571) 272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Daniel C. McCracken/  
Daniel C. McCracken  
Examiner, Art Unit 1793  
DCM

/Edward M. Johnson/  
Edward M. Johnson  
Primary Examiner